

REMARKS

Claim 8 has been amended for clarification purposes and claims 6, 11-32 have been canceled and new claims 33-52 have been added. These amendments are not intended to narrow the scope of these claims. The claims have been rewritten to place them in better form for examination and to further obviate the 35 U.S.C. 112 rejections set forth in the Office Action dated April 21, 2003. It is believed that none of these amendments constitute new matter. Withdrawal of these rejections is requested.

Claims 1, 9 and 18 are objected to for the inclusion of a blank line where the ATCC Accession number should be. Applicant acknowledges the requirement for a deposit of biological material. Upon allowance of the claims in this application, the deposit will be made with the American Type Culture collection and the Accession number will be added in place of the blank line, accordingly, withdrawal of these objections is requested.

The Examiner has rejected claims 6, 8, 10-17, 19, 21, 23-24, 28-29 and 32 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that applicant regards as the invention.

Claim 6, 24 and 29 are stated as indefinite for characterizing their plants as either male sterile or comprising a transgene or single gene conversion. Applicant has canceled claims 6, 24 and 29, accordingly, withdrawal of these rejections is requested.

Claim 8, 19, 21, 23, 28 and 32 are indefinite in their employment of improper Markush terminology. Applicant has amended claim 8 as suggested by the examiner and canceled claims 19, 21, 23, 28 and 32, accordingly, withdrawal of these rejections is requested.

Claim 10, 14 and dependant are indefinite because they are substantial duplicates. Applicant has canceled claims 14-16, accordingly, withdrawal of these rejections is requested.

Claims 1-32 were rejected under 35 U.S.C 112 second paragraph as containing subject matter that was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or which is the most nearly connected to make and or use the invention. Applicant acknowledges the requirement for a deposit of biological material.

Upon allowance of the related claims in this application, the deposit will be made with American Type Culture Collection. As stated in the specification on page 32, the seed deposit is being maintained by Harris Moran Seed Company at their Davis, California facility. The deposit will be available to the Commissioner during the pendency of this application and upon allowance of any claims, deposit of the tomato seed will be made with the American Type Culture Collection.

The undersigned avers that:

- a) access to the invention will be afforded to the Commissioner during the pendency of the application;
- b) all restrictions upon availability to the public will be irrevocably removed upon the granting of a patent;
- c) the deposit will be maintained in a public depository for a period of 30 years or 5 years after the last request or for the enforceable life of the patent, whichever is longer;
- d) a test of the viability of the biological material at the time of deposit; and
- e) the deposit will be replaced if it should ever become inviable or when requested by ATCC.

Accordingly, withdrawal of this rejection is requested.

Claims 6, 11-13, 15-17 and 19-32 are rejected under 35 U.S.C. 112 first paragraph as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the invention was filed, had possession of the claimed invention. Applicant has canceled claims 6, 11-13, 15-17 and 19-32 in favor of new claims 33 to 52 as suggested by the Examiner. Accordingly, withdrawal of this rejection is requested

Claims 6, 11-13, 15-17 and 19-32 are rejected under 35 U.S.C. 112 first paragraph as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which is most nearly connected, to make and/or use the invention. Applicant has canceled claims 6, 11-13, 15-17 and 19-32 in

favor of new claims 33 to 52 as suggested by the Examiner. Accordingly, withdrawal of this rejection is requested.

Assignee, Harris Moran Seed Company presents its views in support of new claims 51 and 52 as well as reasons for canceling claims 21-23 and 32.

Indeed, a plant variety as used by the man skilled in the art of plant breeding means a plant grouping within a single botanical taxon of the lowest known rank which can be defined by the expression of the characteristics resulting from a given genotype for an inbred variety or combination of genotypes for an hybrid variety.

An inbred variety, or inbred line, has been created through several cycles of self-pollination and is therefore considered as an homozygous line. The genome of such a line has identical alleles for all loci of homologous chromosomes and then contains the same linear sequences of genes, each gene being present in duplicate.

As long as the line is strictly self pollinated, the genome is stable and remains identical from generation to generation

Similarly, the genotype being expressed through the phenotype, as long as the arrangement and the organization of the genes remain stable through strictly controlled self-pollination, the phenotype will remain stable as well. The same characteristics will then be expressed from generation to generation and will therefore be predictable.

The inbred line is then a combination of phenotypic characteristics issued from an arrangement and organization of genes created by the man skilled in the art through the breeding process. Claims on inbred lines per se relate to this invention

An hybrid variety is classically created through the fertilization of an ovule from an inbred parental line by the pollen of another, different inbred parental line.

Due to the homozygous state of the inbred parental genome, all gametes,

whether pollen or ovules, produced by a given inbred line will carry a copy of each parental chromosome and be therefore genetically identical, carrying a copy of every gene as arranged and organized in the original genome of the parental inbred line.

Therefore, both the ovule and the pollen bring a copy of the arrangement and organization of the genes present in the parental lines. The genome of each parental line is present in the resulting hybrid (also known as F1 hybrid) in the same arrangement and organization as created by the plant breeder in the original parental line.

The cross between two different inbred parental lines is therefore predictable, it will contain fifty percent of the genome of each inbred parental line.

In addition, and as long as the homozygosity of the parental lines is maintained, the resulting hybrid cross will be stable, whether genetically or phenotypically .

The F1 hybrid is then a combination of phenotypic characteristics issued from two arrangement and organization of genes, both having been created by a man skilled in the art through the breeding process. Each arrangement and organization of the genome is present in the F1 hybrid as it has been created by the breeder in the inbred.

For a plant breeder having the genetic and phenotypic knowledge of the inbred to be used, the creation on an F1 hybrid is therefore highly predictable. For example, dominant alleles present and expressed in an inbred line, will be brought by the gamete and expressed by the F1 hybrid.

Applicant therefore submits that new claims 51 and 52 on a hybrid tomato seed wherein fifty percent of its genetic material (genome) originates from the gametes produced by the original inbred satisfies the provisions of 35 USC 112 first paragraph. Applicant further supports its new claims by paragraph 0013 of the specification where it is mentioned that the development of commercial tomato hybrids require the development of homozygous inbred lines, the crossing of these lines and the evaluation of the crosses. For any man skilled in the art, i.e. a plant breeder, the result of such a cross of inbred lines will contain fifty percent of the genome of each inbred parental line

When an F1 hybrid variety is used for further breeding, as mentioned in claims 21 to 23 or 32, also known as "progeny claims", the situation changes

dramatically.

The genome of an F1 hybrid is composed by a copy of the genetic maternal material, bought by the ovule and a copy of the genome of the genetic paternal material, bought by the pollen.

The genome of the F1 hybrid can be reproduced constantly by crossing the inbred parental lines and is identical as long as the homozygosity of the inbred parental lines is safeguarded,

However, when the F1 hybrid itself produces gametes, the phenomenon that take place during the meiosis will lead to gametes that are different and totally unpredictable in the arrangement and organization of the genes carried out. As a result, the F2 generation, whether produced by auto-pollinating the F1 hybrid (the pollen produced by F1 hybrid fertilizes the ovule produced by the same F1 hybrid) or by inter-crossing two different F1 hybrids (the pollen produced by one F1 hybrid fertilizes an ovule produced by another, different F1 hybrid), will be genetically and phenotypically completely different from one resulting F2 plant to another but also from the parental F1 hybrids. Similarly, subsequent generation, usually known by a man skilled in the art as F3, F4, F5, ... Fn or "progeny", will be from one generation to the next, more and more genetically and phenotypically different because of the increasing number of meiosis phenomenon.

First, due to the chromosome recombination, the gametes created through the meiosis will have an arbitrary content of maternal or paternal origin of the chromosomes. The different chromosomes segregating independently, the gametes will all have the same number of chromosomes, but with a different ratio of maternal or paternal origin. This part of the meiosis only will lead to gametes, whether ovules or pollen, that have completely different genetic content. The larger the number of chromosomes, the more chromosome recombination occur.

Second, and in addition, the homologous recombination process will lead to the exchange, also known as crossing over of numerous DNA regions by their homologous DNA sequences from the homologous chromosome. This second part, resulting from the exchange between chromatids paired chromosomes, will complete the melange of the genes and lead to gametes that definitively have different genetic background. The genes are randomly rearranged and the genetic information carried by the gamete is then totally unpredictable.

As long as both copies of the chromosome have the same information, as it is the case for an inbred, these phenomena do not lead to any changes in the

genomes and all gametes produced are identical.

But for an F1 hybrid which chromosomes copies originate from different inbreds, both processes will lead to different gametes, having parts of their genome originating from one inbred, other parts originating from the other inbred.

Therefore the arrangement and organization created by the plant breeder in the original parental line, that was also present in the F1 hybrid is lost when the gametes are produced. The arrangement and organization of the genome in the gamete and also in the subsequent F2, F3, F4, Fn generation and progeny plant produced through fertilization and development of the embryo is no longer the work of the plant breeder, but is completely random.

Therefore, as the arrangement and organization created by the plant breeder in the original parental line is lost, the phenotypic expression of said genetic organization is lost and the F2, F3, F4, Fn plants, seeds and progeny after the initial F1 hybrid have nothing in common with the original inbred and F1 hybrid. There is no way to predict what can be the outcome of such a progeny, what can be its genetic organization or how this organization can be expressed by the plant.

As the integrity of the arrangement and organization of the genome is no longer present in the progeny and successive generations and as the genomic organization and the phenotypic expression resulting thereof are completely unpredictable, applicant therefore abandons claims 21 to 23 and 32.

If Examiner or her supervisors are interested in further discussing this subject, applicant agrees and is willing to meet with them at their convenience

Regarding the single gene conversion remarks of the examiner, applicant respectfully disagrees with examiner regarding the unpredictability of the introgression of genes or genes into the genetic background of a different plant. Accordingly to Hallauer, A.R. et al. (1988) "Corn Breeding" Corn and Corn Improvement, No. 18, pp. 463-481, backcross method of breeding is an important component of most breeding program that counted, in 1981 for 17% of the total breeding effort for inbred line development. It is also said that the complexity of the backcross method depends on type of traits being transferred, but that for single genes, the backcross method is effective and relatively easy to manage. Therefore,

applicant submits that one skilled in the art, i.e. a plant breeder shall readily use the tomato line of the present invention for backcrossing leading to a 294 tomato plant further comprising a single gene conversion. Applicants submits that the waxy (wx) gene is a recessive single gene that is used in corn breeding to create corn varieties where the starch content is 100% composed by amylopectin whereas normal corn contains 75 percent amylopectin and 25 percent amylose. Another example could be the Opaque-2, another single gene used to produce High Lysine corn that contains increased levels of two amino acids--lysine and tryptophane. Applicant submits that both genes can be transferred by a man skilled in the art of plant breeding from one genetic background to another using backcross technique.

Applicant further submits R.W. Allard 's 1960 book, published by John Wiley & Sons, Inc, "Principles of Plant Breeding", chapter 14. Page 150 of the reference, Professor Allard states that the backcross breeding method makes use of a series of backcrosses to the variety to be improved during which the character in which improvement is sought is maintained by selection. It further mentions that the backcross will result in a variety with exactly the adaptation, yielding ability and quality characteristics of the recurrent parent, but superior to that parent in the particular characteristic for which the improvement program was undertaken. He adds, at the bottom of said page 150, that the method was scientifically exact because the morphological and agricultural features of the improved variety could be described accurately in advance and because the same variety could, if it were desired, be bred a second time by retracing the same steps.

On page 153 of the document, Prof. Allard states that backcrossing is a powerful mechanism for achieving homozygosity and that any population obtained by backcrossing must rapidly converge on the genotype of the recurrent parent. It is also mentioned that when backcrossing is made the basis of a plant breeding program, the genotype of the recurrent parent will be modified only with regards to genes being transferred. Further, on page 158, Prof. Allard gives examples of successful backcrosses, for example the transfer of stem rust resistance from "Hope" wheat to "Bart wheat" and even pursuing the

backcrosses with the transfer of bunt resistance to create "Bart 38", having both resistances. Similarly, but in open pollinated crops, Prof. Allard describes on page 161, the successful transfer of mildew, leaf spot and wilt resistances in California Common. Applicant points out that Prof. Allard states that Caliverde, the new variety produced through the backcross process is indistinguishable from California Common except for its resistance to the three named diseases.

On the same page, Prof. Allard mentions that one of the advantages of the backcross method is that the breeding program can be carried out in almost every environment that will allow the development of the character being transferred. He also states that the backcross technique is not only desirable when breeding for disease resistance but also for the adjustment of morphological characters, colour characteristics and simply inherited quantitative characters such as earliness, plant height and seed size and shape.

Applicant would like to point out that Professor Allard was one of the most renowned plant breeders of the United States. He was one of the leading plant breeders of his generation and he wrote the major textbook on plant breeding, which was widely adopted in the U.S. and abroad. Elected to the U.S. National Academy of Sciences, he contributed importantly to developing and then applying new knowledge for the improvement of agriculture.

In light of the previous, applicant further submit that single gene conversion is a reliable method for breeding and for the introgression of gene(s) from one plant into the genetic background of a different plant.

Therefore, applicant requests the rejection on single gene conversion be withdrawn and new claims 49 and 50 be allowed.

Applicant also would like to point out that the teaching of Kraft et al. does not prevent the use of single gene conversion techniques, but instead shows that for an ancestral line for which two loci are fixed for alleles otherwise rare in the breeding germplasm, all lines descending from said ancestral line are necessarily fixed for this particular two locus genotype (see p.324 column 2). In other words, if an inbred line has for example a gene

conferring resistance to disease, said gene might well be transferred to subsequent descending generation, for example through introgression of the gene by backcrossing.

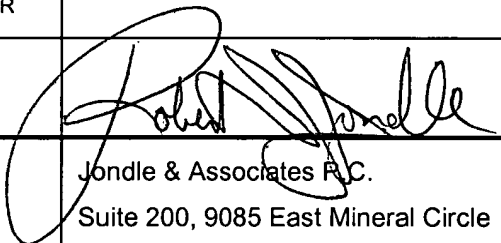
Claims 21, 23, 28 and 32 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Nahum (US 4,843,186) and Morrison et al. (US 5,438, 152).

Applicant has canceled claims 21, 23, 28 and 32, accordingly, withdrawal of this rejection is requested

Claims 21, 23, 28 and 32 are rejected under 35 U.S.C. 102(b) as anticipated by Hoogstraten.

Applicant has canceled claims 21, 23, 28 and 32, accordingly, withdrawal of this rejection is requested

In view of the above amendments and remarks, it is submitted that the claim satisfies the provisions of 35 U.S.C. '112 and is not obvious over the prior art. Reconsideration of this application and early notice of allowance is requested.

RESPECTFULLY SUBMITTED,					
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